

FIG. 1 PRIOR ART

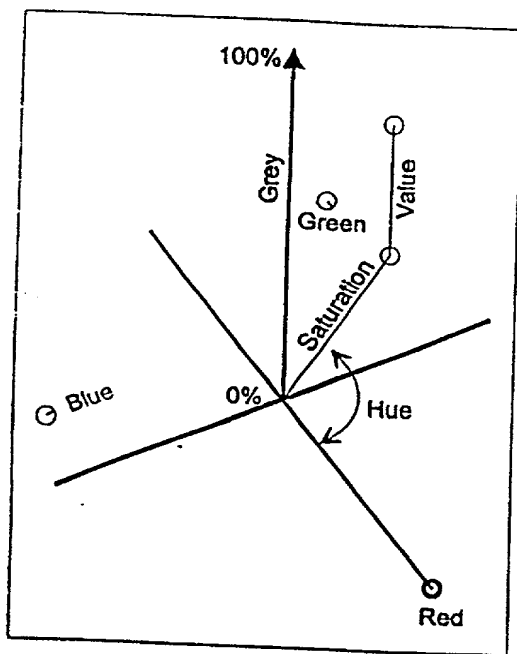


FIG. 2 PRIOR ART

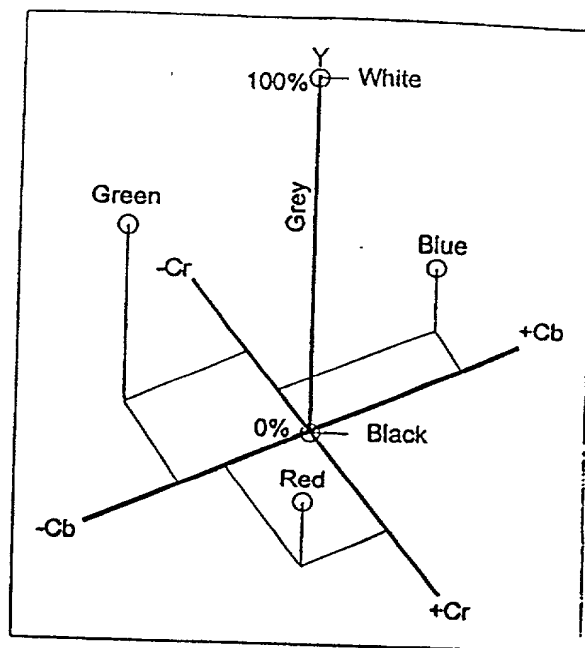


FIG. 3 PRIOR ART

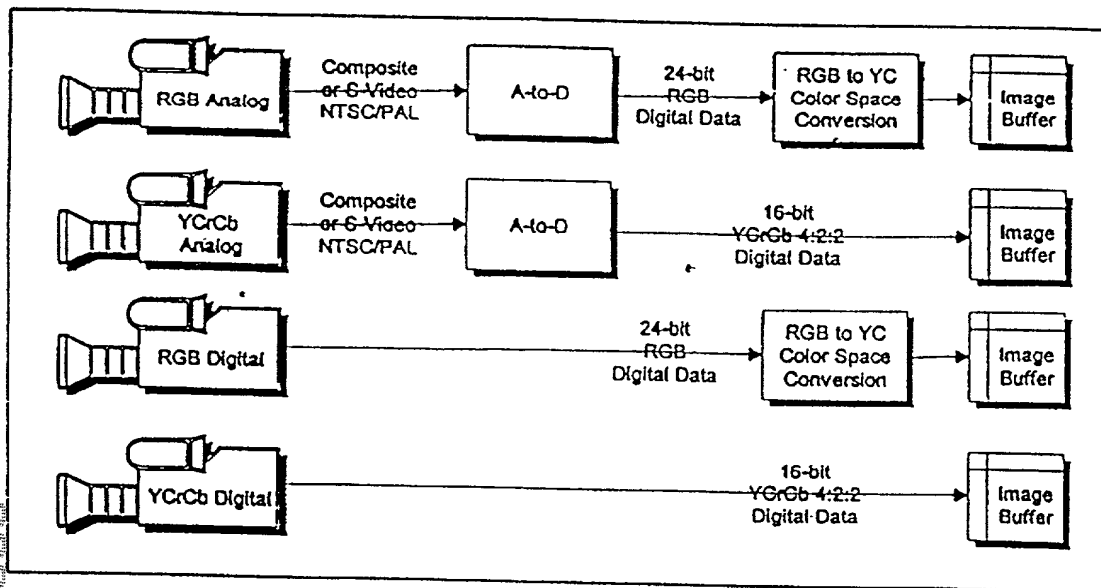


FIG. 4

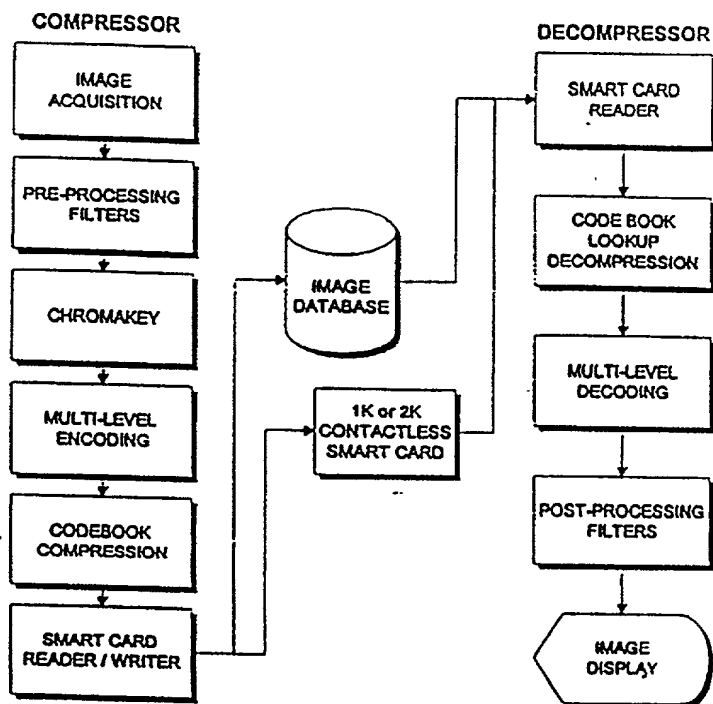


FIG. 5

If all pixels are within a specified threshold, the output is the average of the four pixels, two on each side of the target.

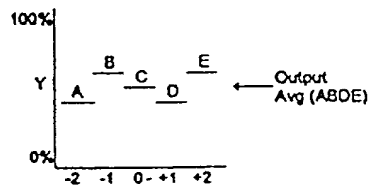
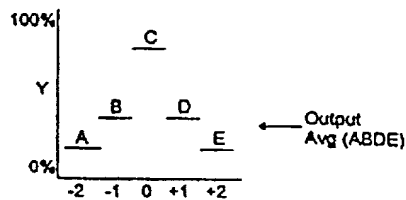
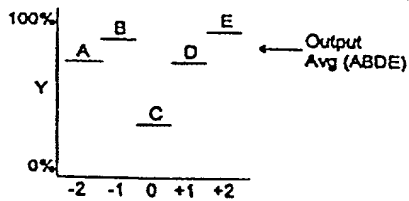


FIG. 6

If the two pixels on either side are within a specified threshold and both sides themselves are within the



threshold, the target pixel is considered to be impulse noise. The output is the average of the two pixels on each side of the target.

FIG. 7

If the two pixels on either side of the target pixel and the target pixel itself are within a specified threshold, the target pixel is considered to be an edge pixel. The output is the average of the two pixels on the matching side.

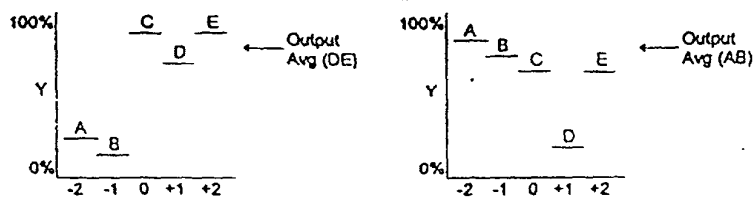


FIG. 8

If the five pixels are all increasing or decreasing (or are within a small threshold to account for ringing or pre-emphasis typically found in analog video signals), the target is considered to be in the midst of a blurred edge. The output is the average of the two pixels on whichever side is closest to the target pixel.

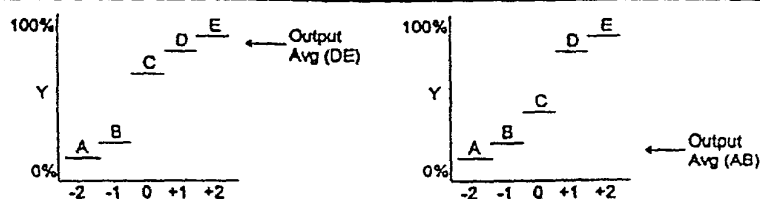


FIG. 9

If the five pixels in the window do not fit into any of the prior cases, the target is considered to be in the midst of a busy area. The target pixel is output unchanged.

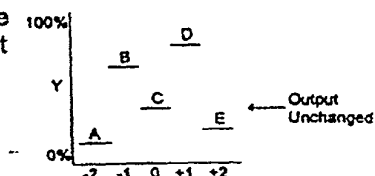
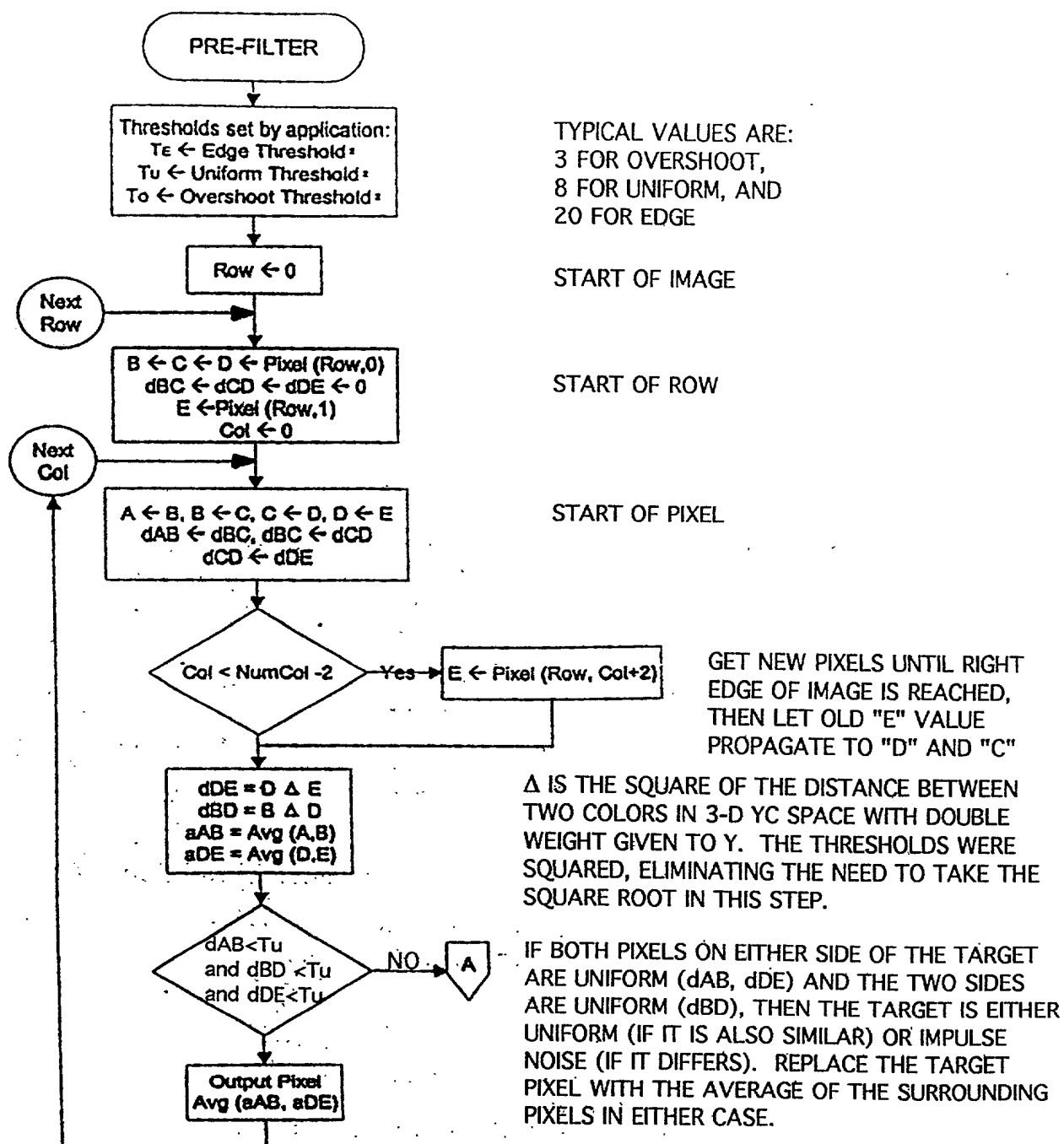


FIG. 10



TYPICAL VALUES ARE:
 3 FOR OVERSHOOT,
 8 FOR UNIFORM, AND
 20 FOR EDGE

START OF IMAGE

START OF ROW

START OF PIXEL

FIG. 11A

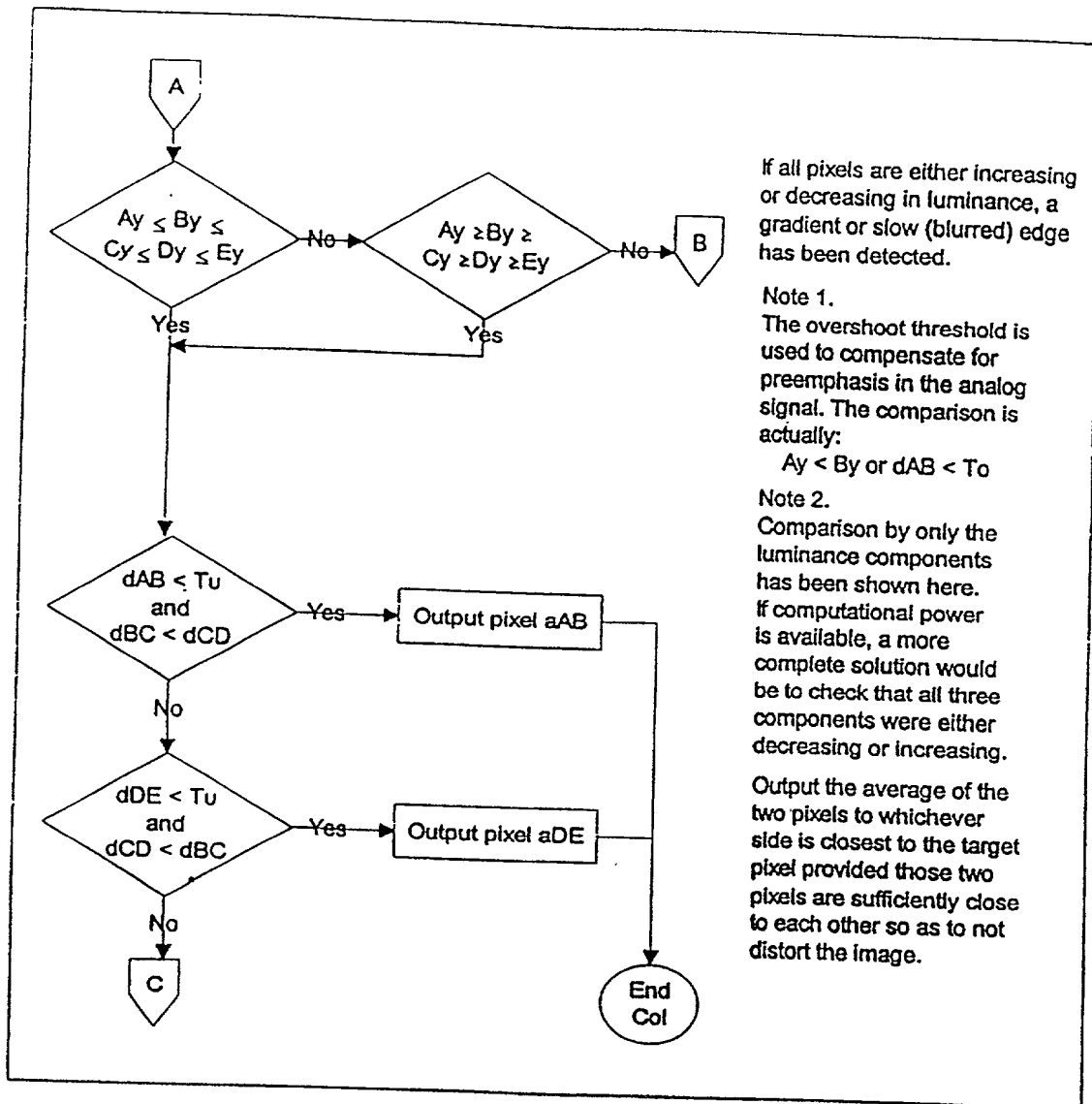


FIG. IIB

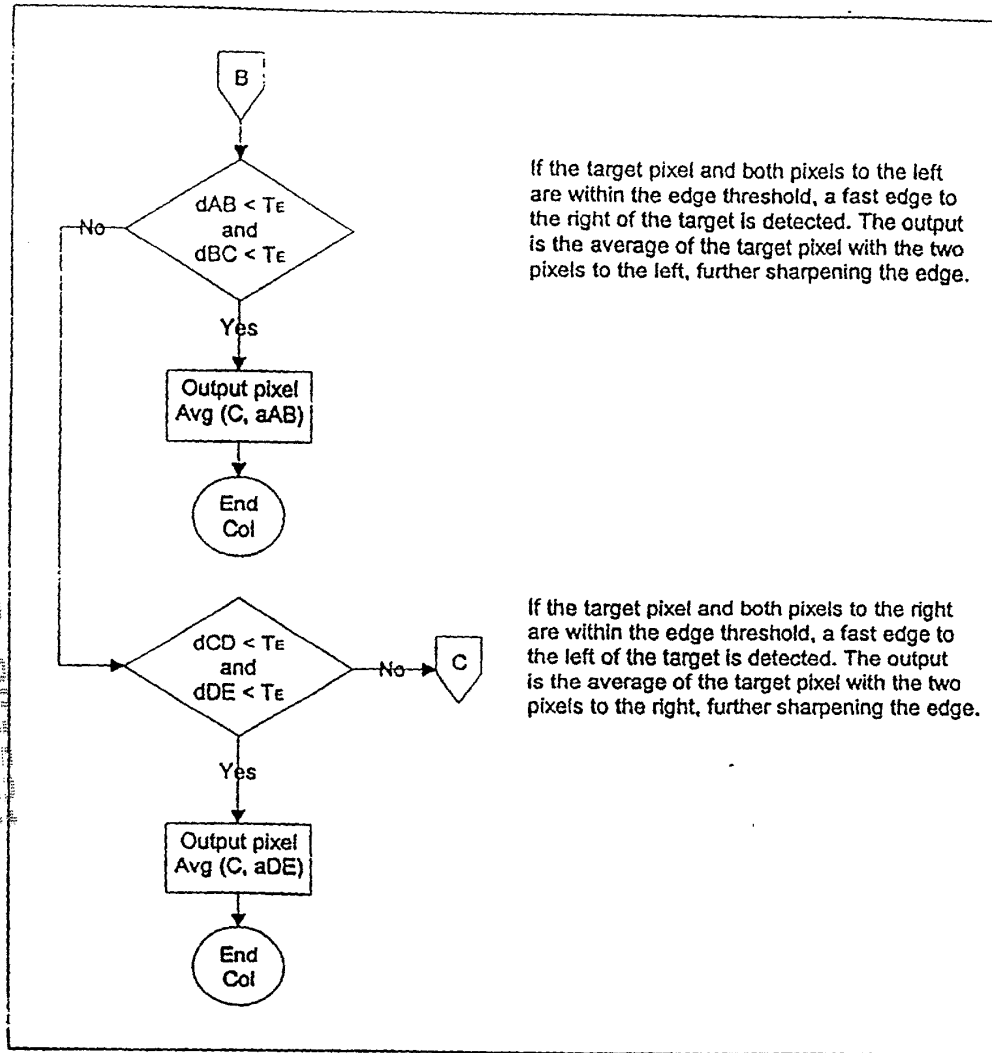
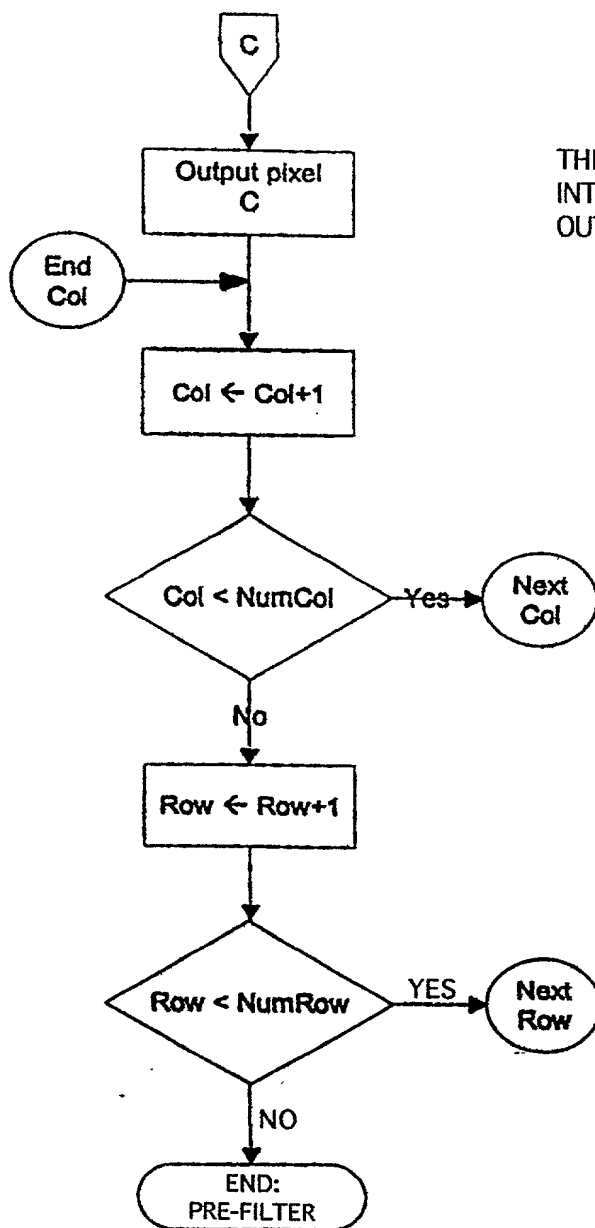


FIG. 11C



THE TARGET PIXEL HAS NOT FALLEN INTO ANY OF THE CASES, SO IT IS OUTPUT UNCHANGED.

FIG. 11D

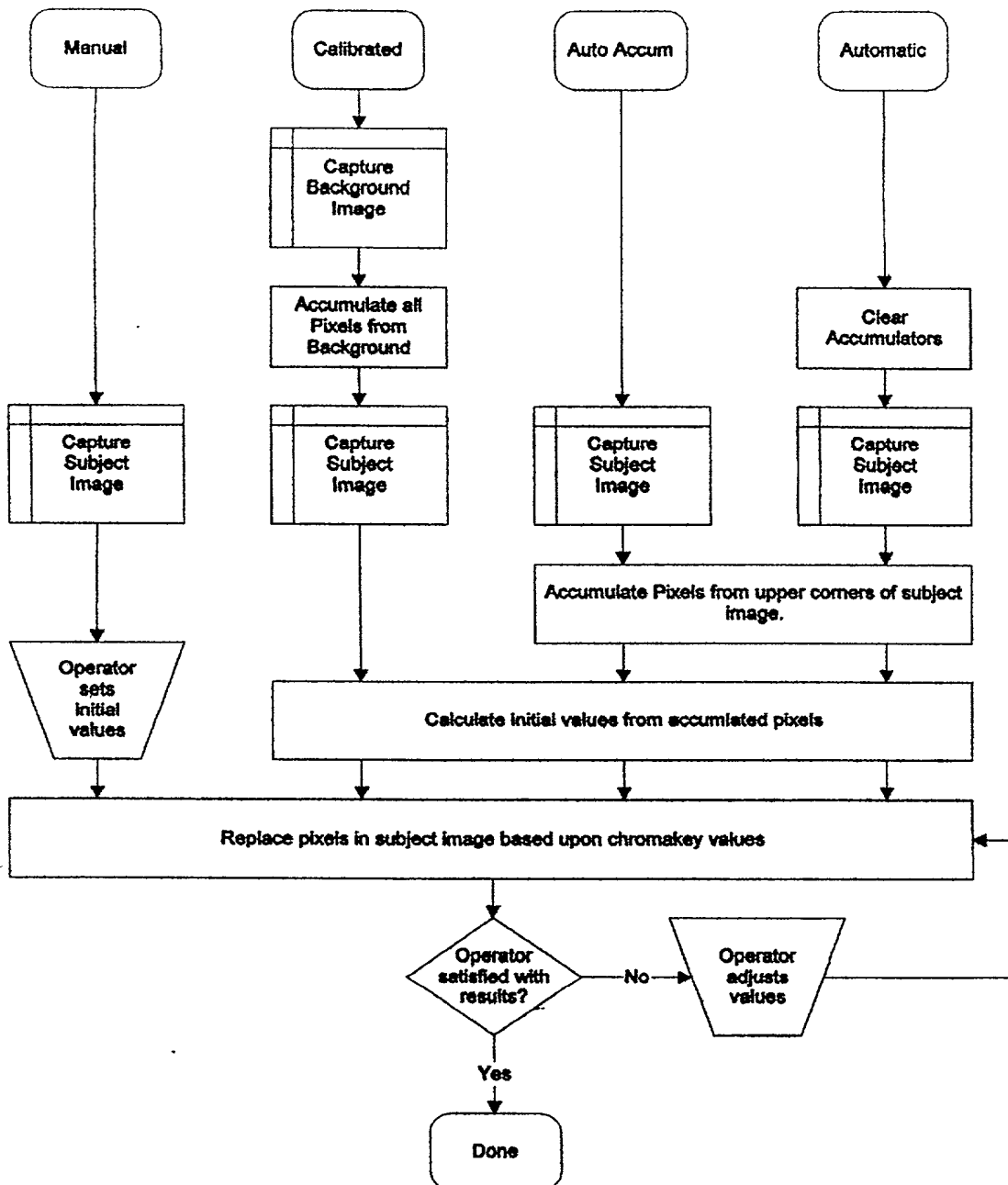


FIG. 11E

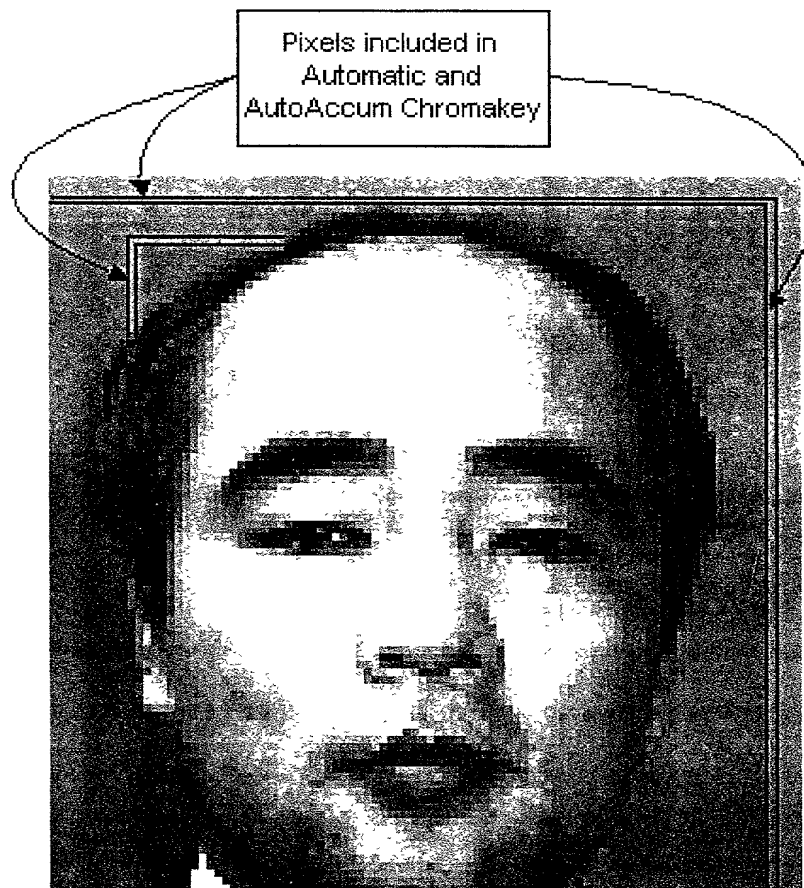
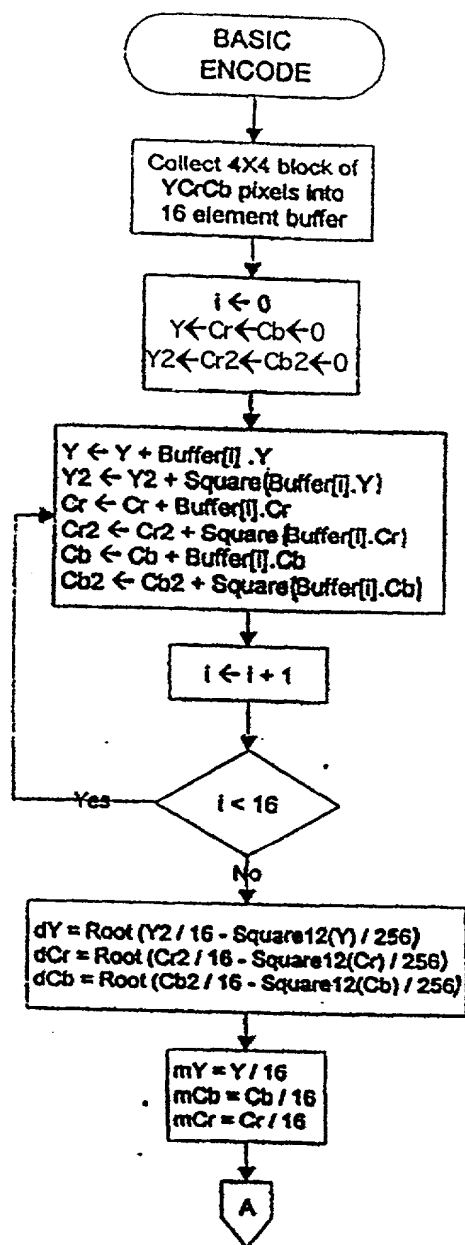


FIG. 11F



Buffer index will range from 0 to 15.
Color components will be referred to as: ".Y", ".Cr", and ".Cb"

Step 1 - Collect first and second moments

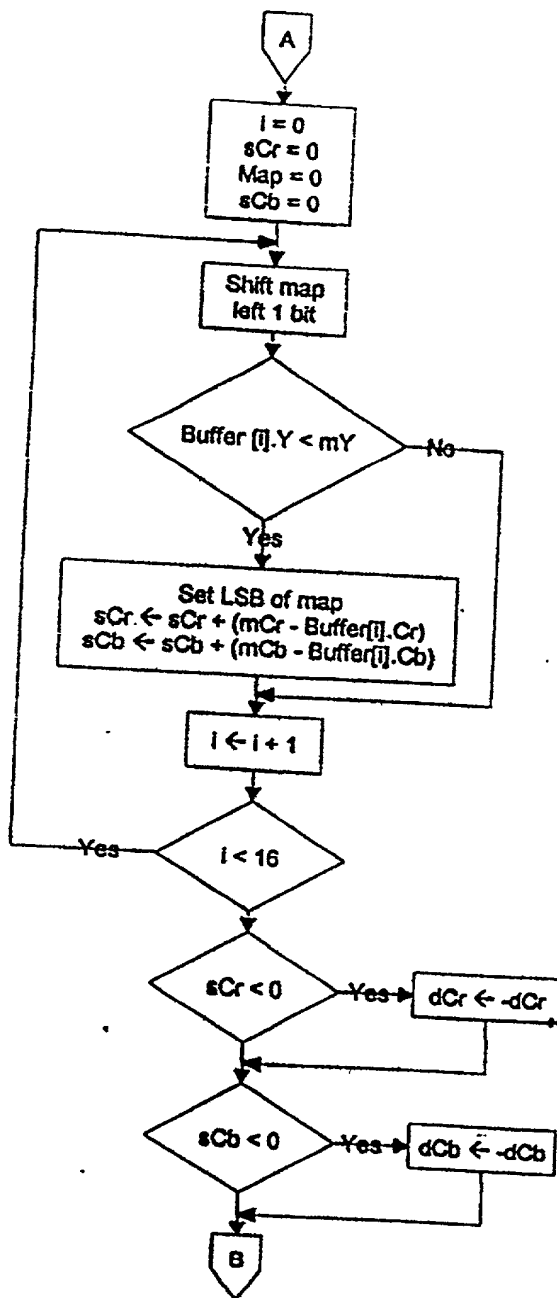
Accumulate separate component values as squares for each pixel. Squares are calculated by table lookup rather than by multiplication.

Step 2 - Calculate mean and standard deviation

The square12 function calculates the square of a 12-bit number using the same 8-bit table of squares above and little extra arithmetic. The root function finds roots by binary search of the 8-bit table of squares.

dY, dCr, and dCb are the standard deviations for each component and mY, mCr, and mCb are the arithmetic means.

FIG. 12A



Step 3 - Determine selector map

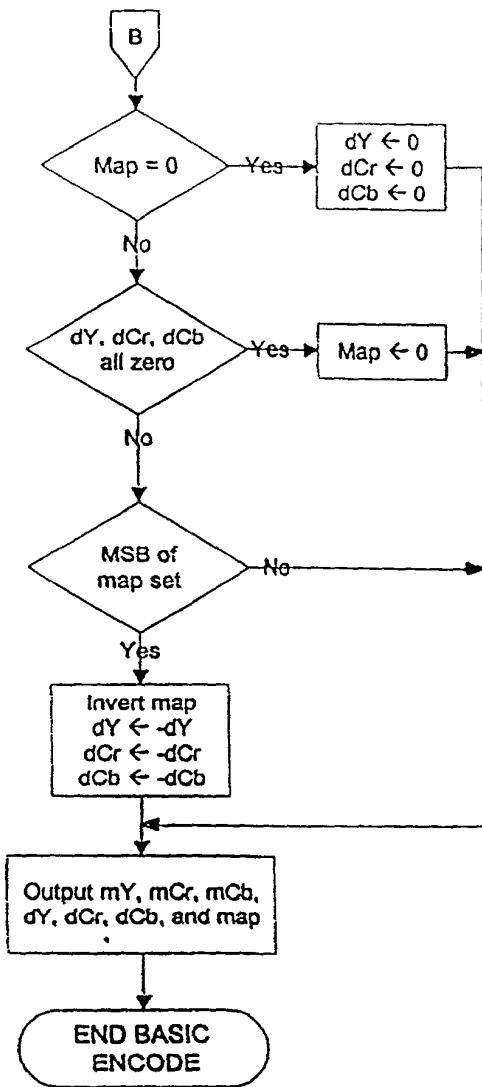
Use the mean luminance value for the selector.

The one bits in the map mark those pixels that are "darker" than the mean. Accumulate the signed differences from the mean in each chrominance channel.

If the Cr channel decreases when the luminance increases, invert dCr.

If the Cb channel decreases when the luminance increases, invert dCb.

FIG. 12B



Step 4 - Normalize

If the luminance of all pixels is equal to (or, in practice, slightly greater than) the mean, zero all standard deviation values.

If all of the pixels are nearly equal, the standard deviations will all be zero. In this case the map is also zeroed.

To reduce the number of possible maps from 65,536 to 32,768, if the map is set, the map is inverted and the dY, dCr, and dCb values are negated.

Typically 8 bits are used for each of the mY, mCr, mCb, dY, dCr, and dCb values and 16 bits are used for the map.

FIG. 12C -

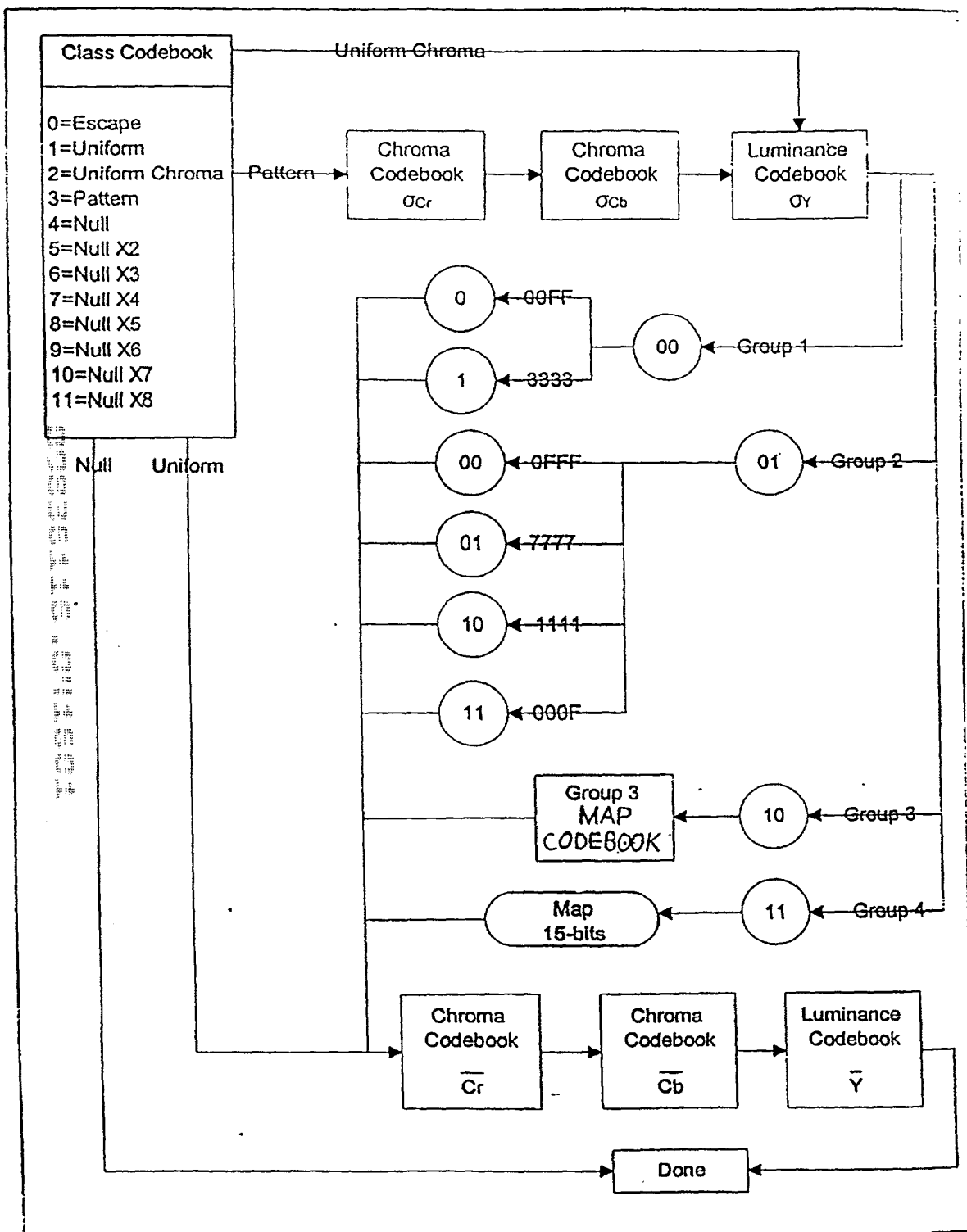


FIG. 13

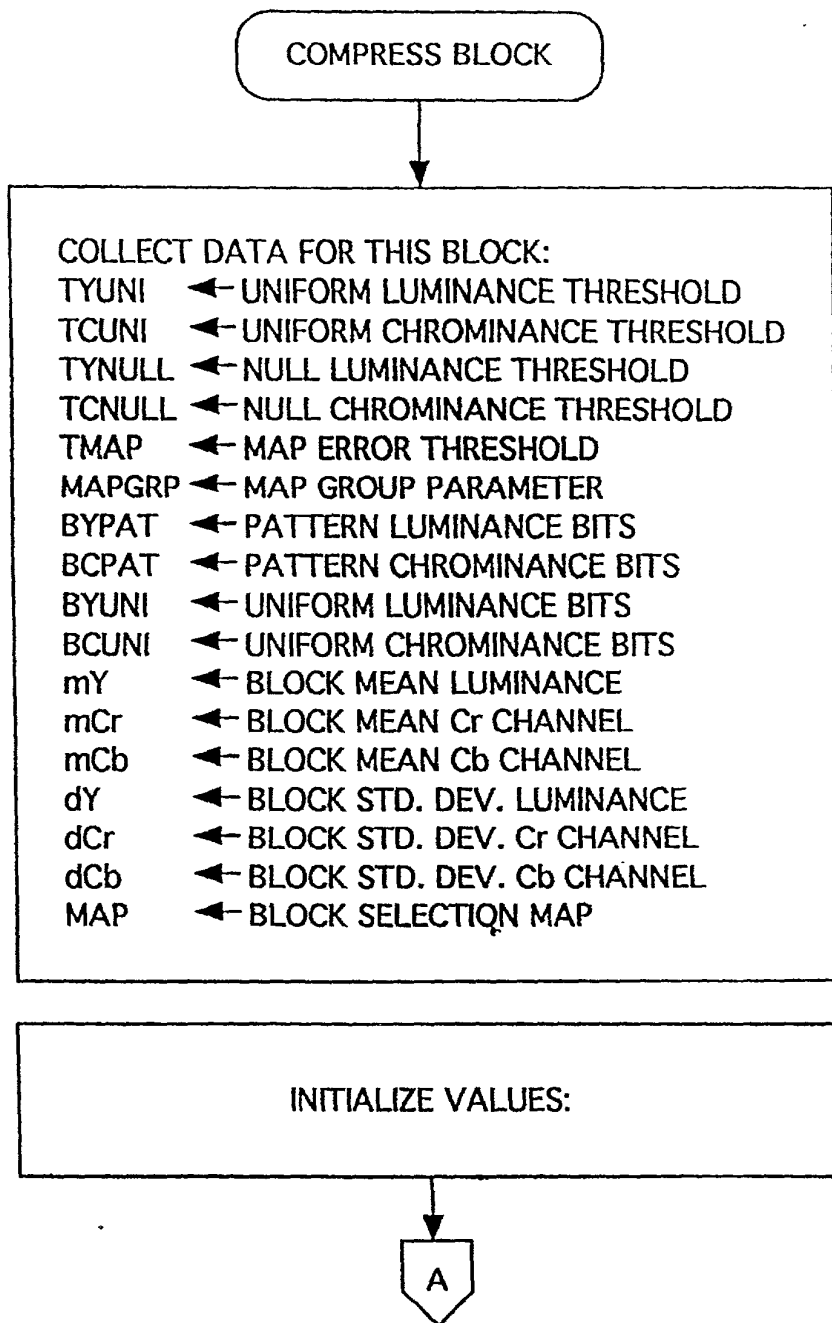


FIG. 14A

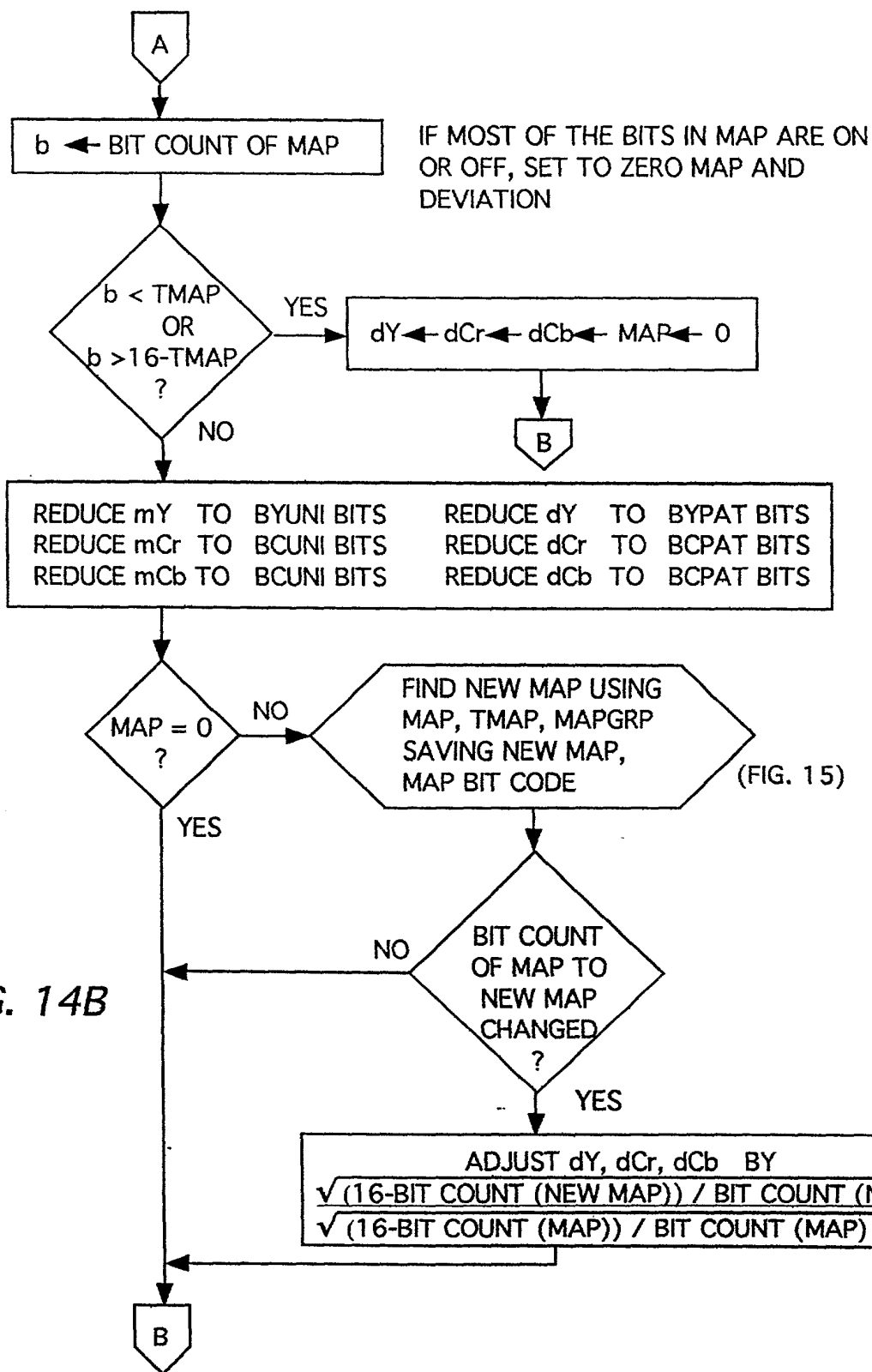


FIG. 14B

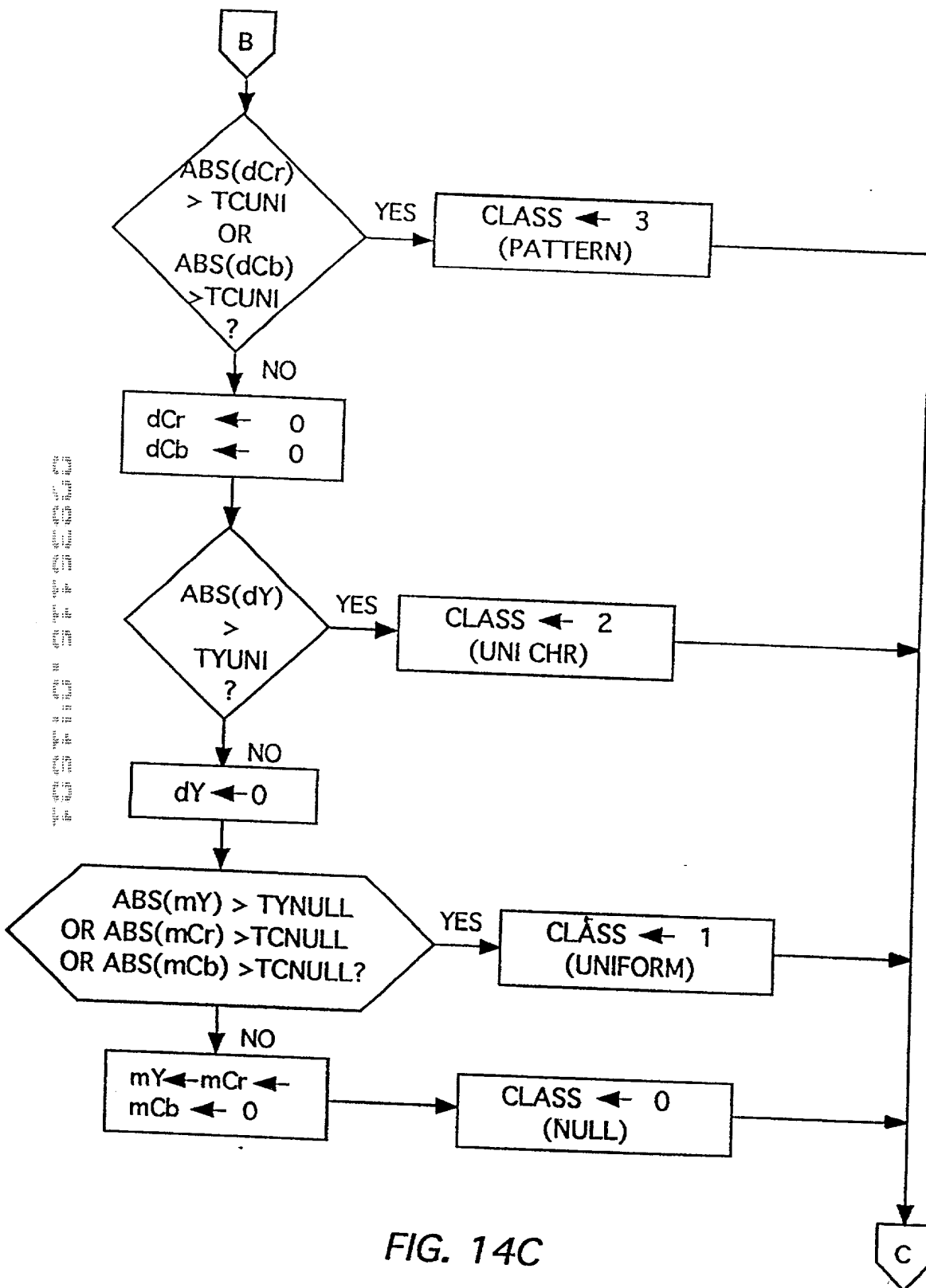
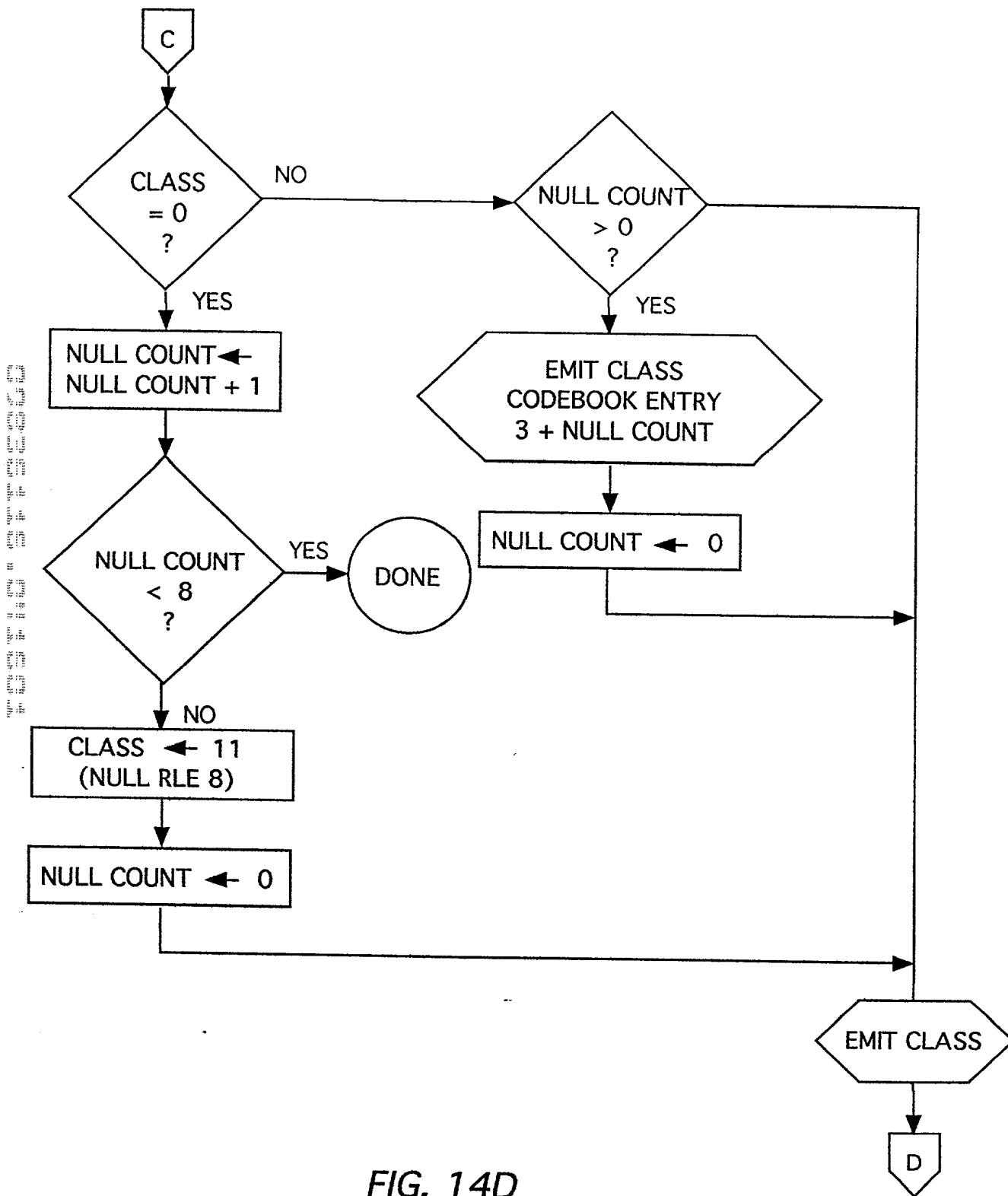


FIG. 14C



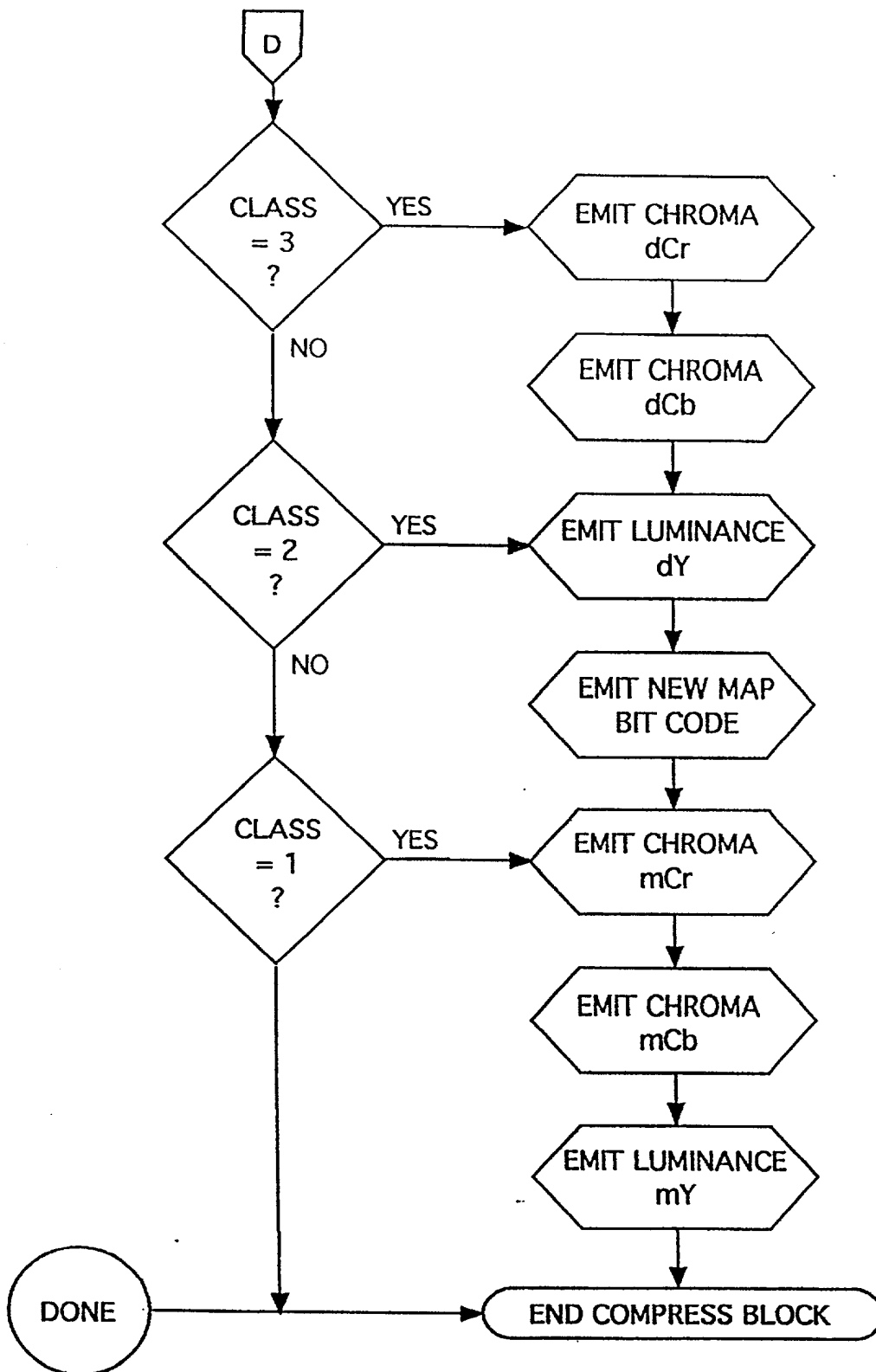


FIG. 14E

FIG. 15A

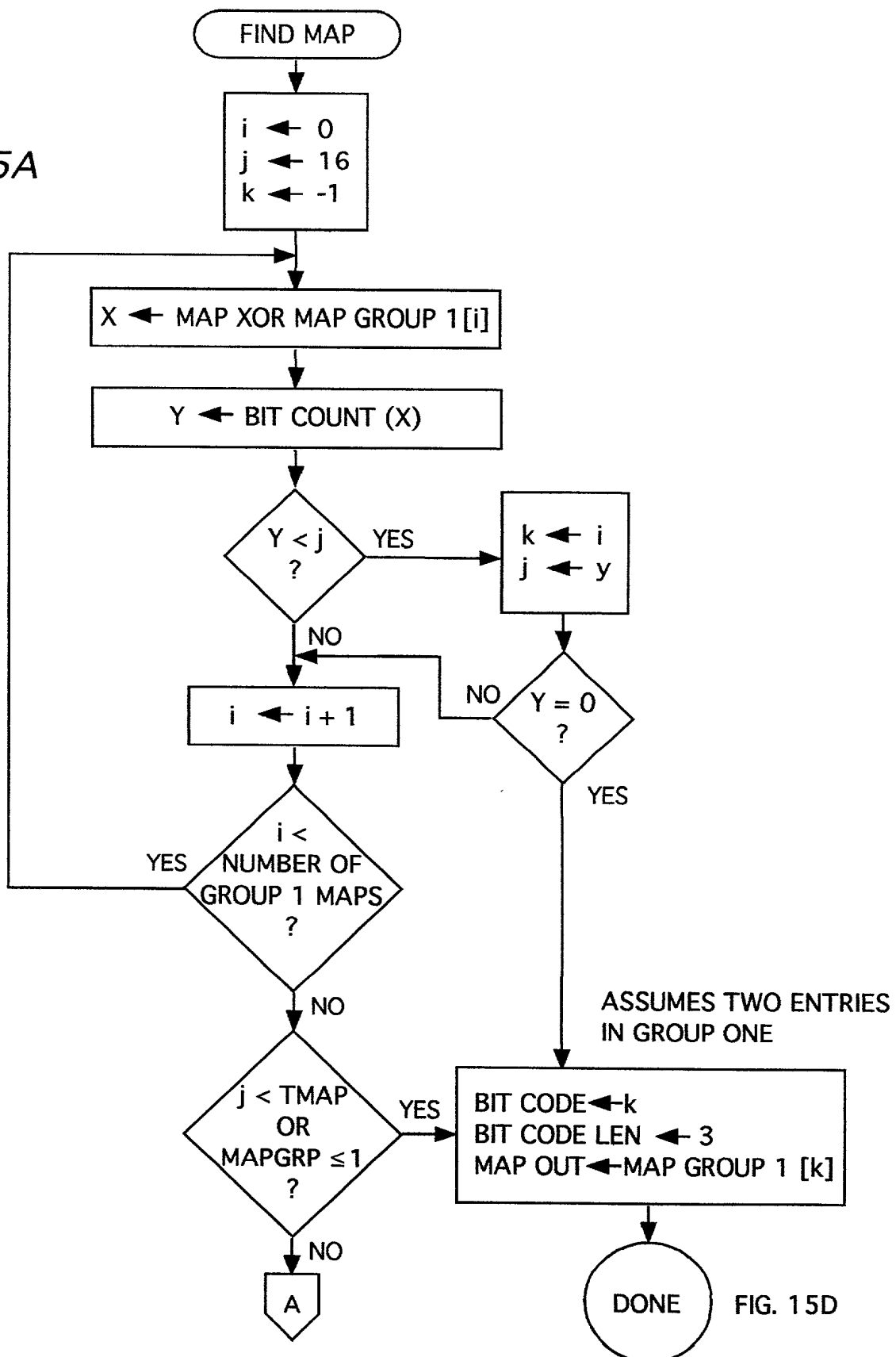


FIG. 15B

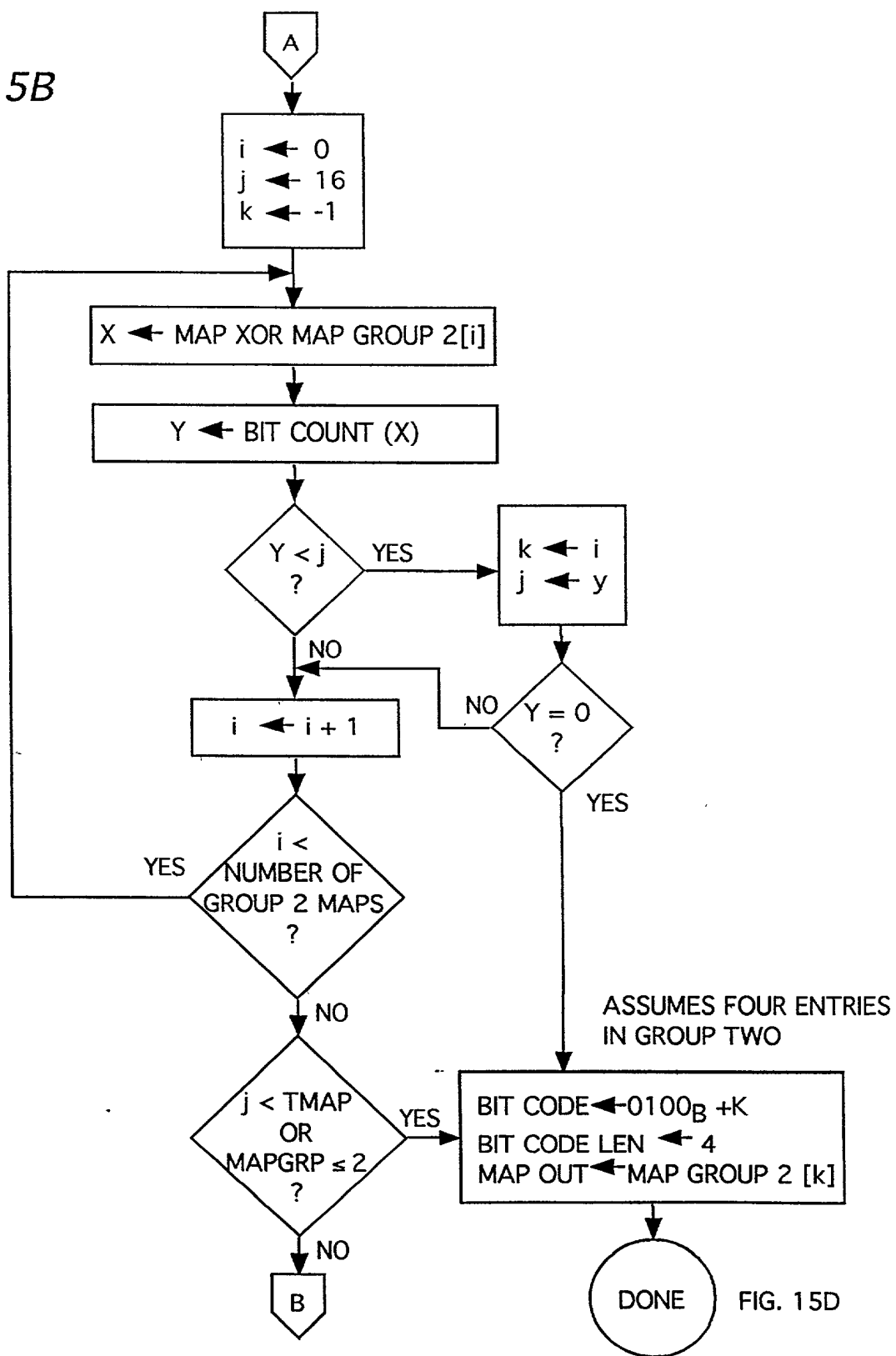


FIG. 15C

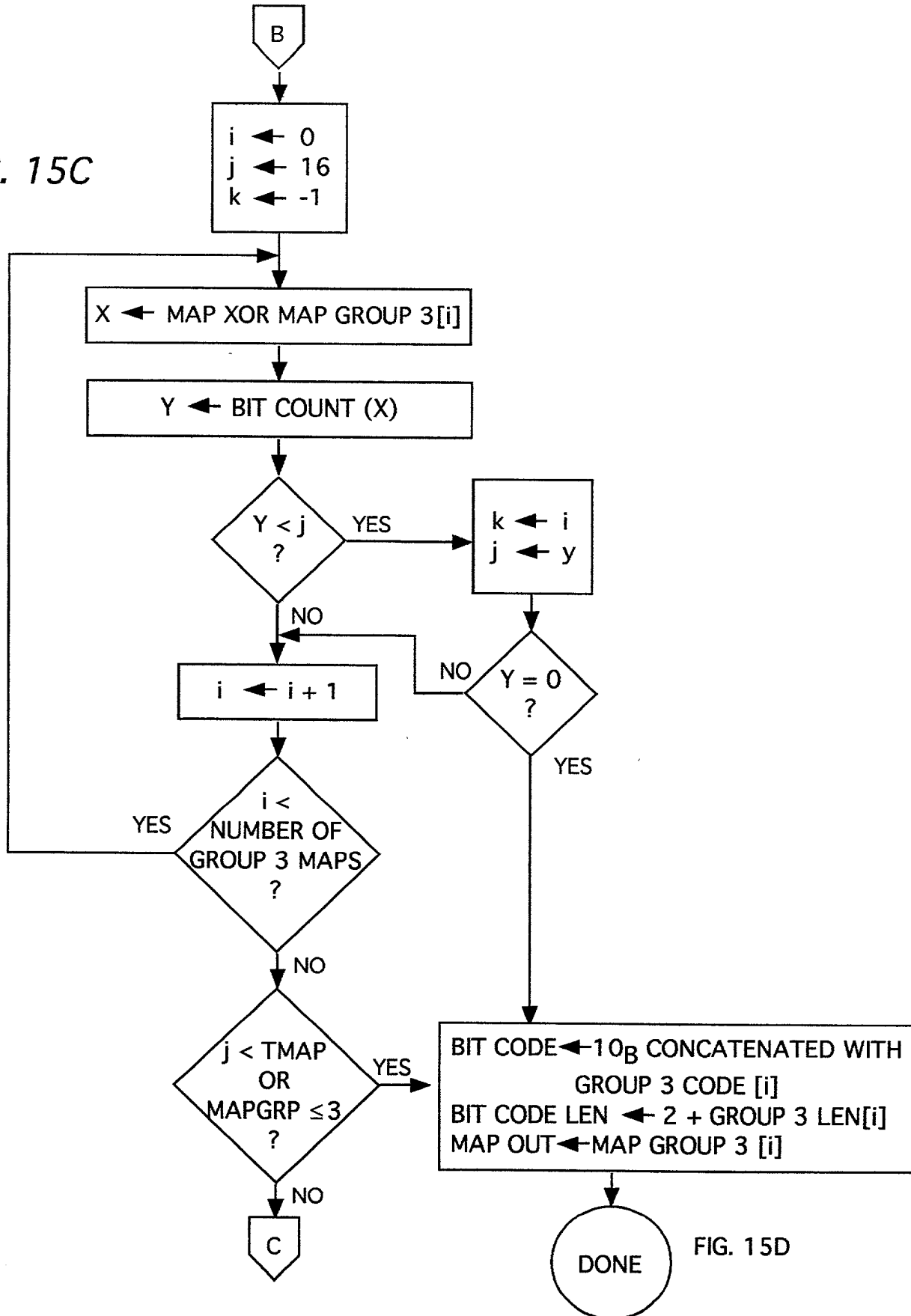


FIG. 16A

D	D	D	D	D	D
D	C	B	B	C	D
D	B	A	A	B	D
D	B	A	A	B	D
D	C	B	B	C	D
D	D	D	D	D	D

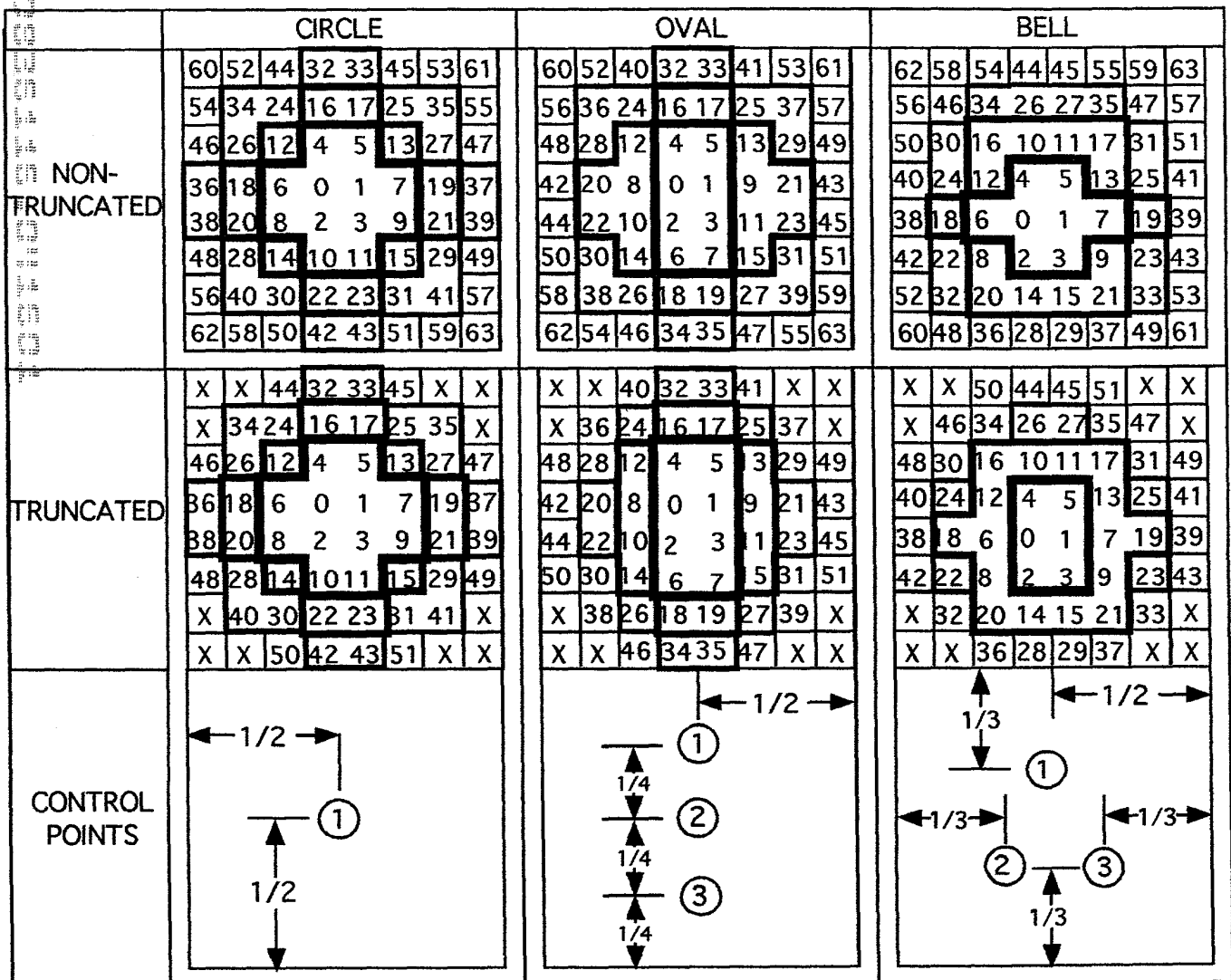


FIG. 16B

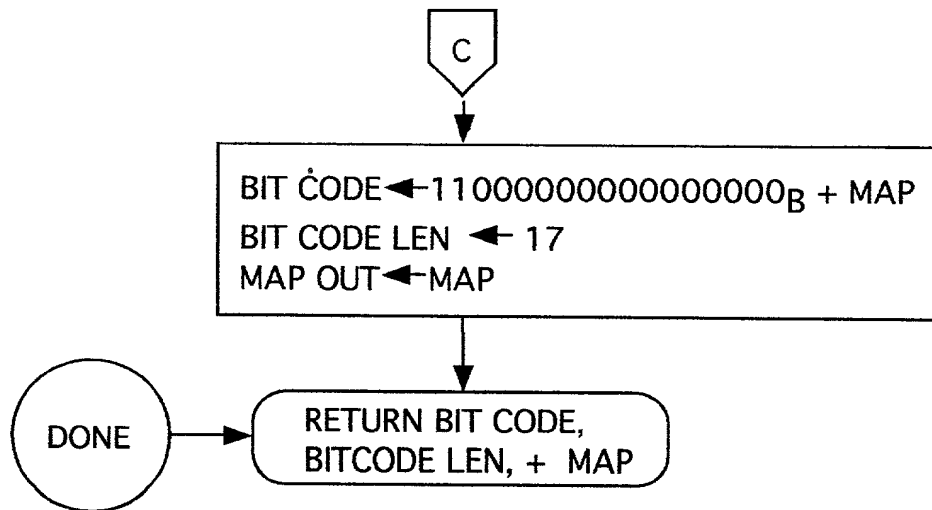


FIG. 15D

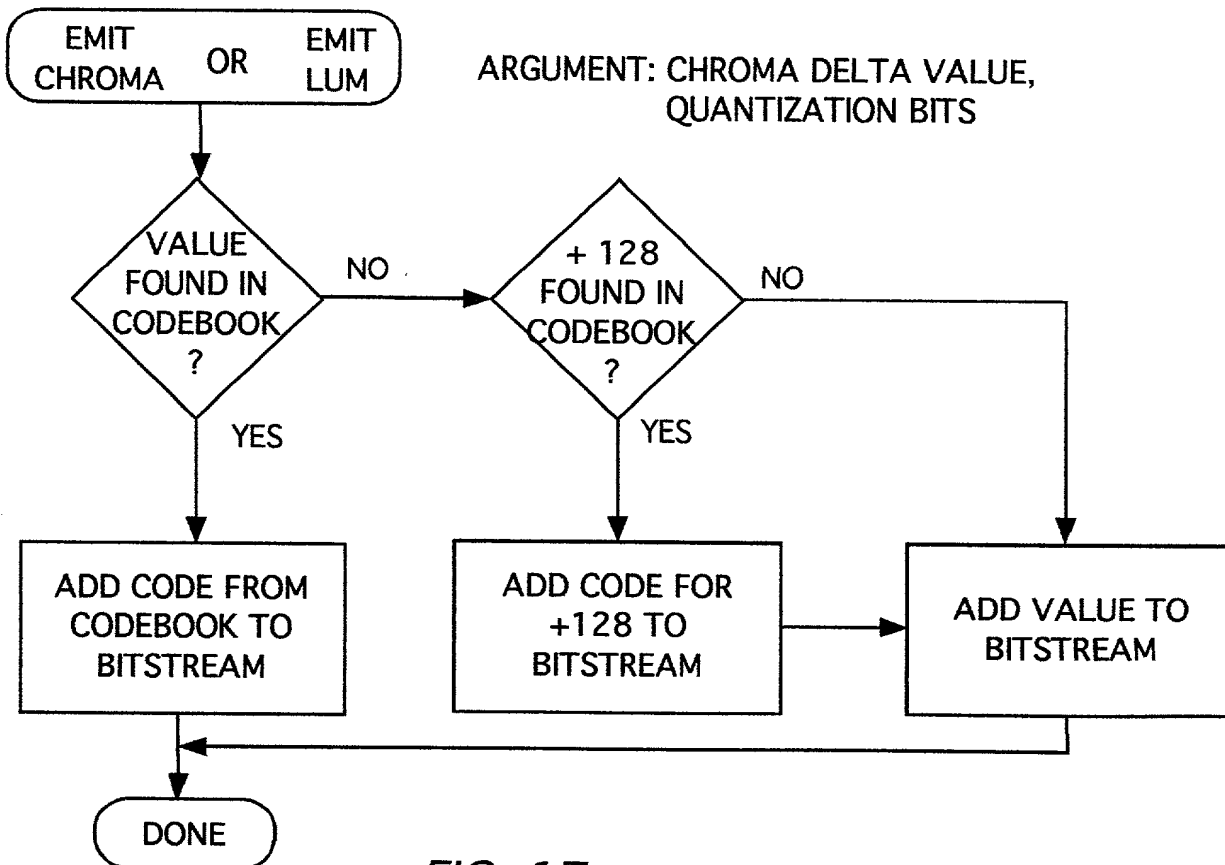


FIG. 17

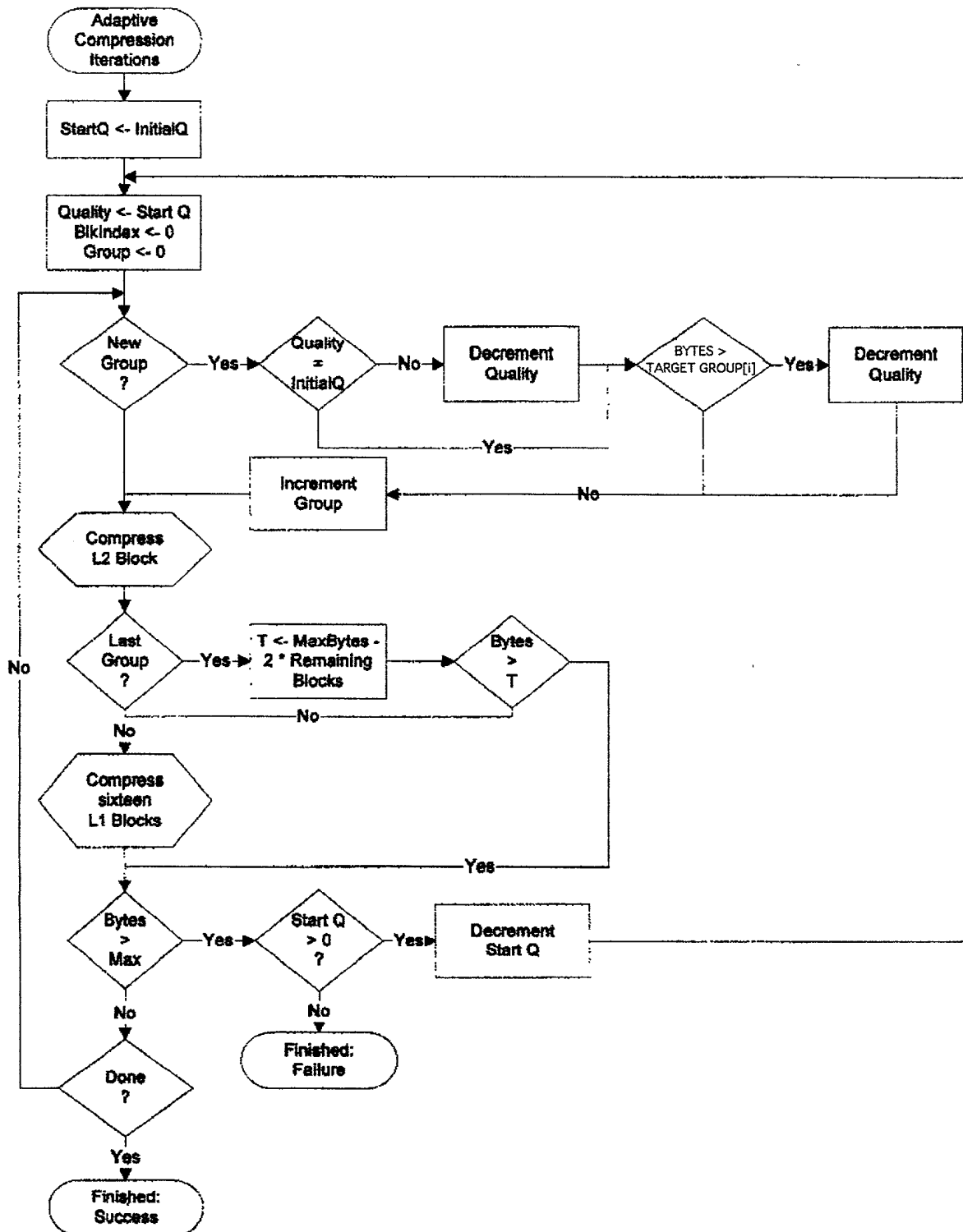


FIG. 18

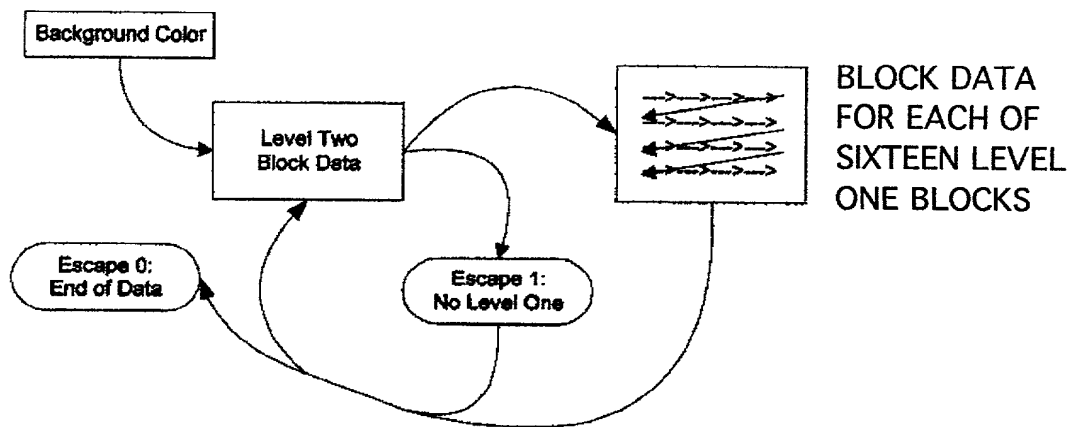


FIG. 19

Input				
A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
U	V	W	X	Y

FIG. 20A

Light Edge Filter				
A	3B/4 C/4	3C/4 B/4	D	E
3F/4 K/4	9G/16 3H/16 3L/16 M/16	9H/16 3G/16 3M/16 L/16	3I/4 N/4	3J/4 O/4
3K/4 G/4	9L/16 3M/16 3G/16 H/16	9M/16 3L/16 3H/16 G/16	3N/4 I/4	3O/4 J/4
P	3Q/4 R/4	3R/4 Q/4	S	T
U	3V/4 W/4	3W/4 V/4	X	Y

FIG. 20B

Medium Edge Filter				
A	28F/3 C/3	2C/3 B/3	D	E
2F/3 K/3	4G/9 2H/9 2L/9 M/9	4H/9 2G/9 2M/9 L/9	2I/3 N/3	2J/3 O/3
2K/3 F/3	4L/9 2M/9 2G/9 H/9	4M/9 2L/9 2H/9 G/9	2N/3 I/3	2O/3 J/3
P	2Q/3 R/3	2R/3 Q/3	S	T
U	2V/3 W/3	2W/3 V/3	X	Y

FIG. 20C

Heavy Edge Filter				
A	B/2 C/2	C/2 B/2	D	E
F/2 K/2	H/4 G/4 M/4 L/4	H/4 G/4 M/4 L/4	I/2 N/2	J/2 O/2
K/2 F/2	H/4 G/4 M/4 L/4	H/4 G/4 M/4 L/4	I/2 N/2	J/2 O/2
P	Q/2 R/2	R/2 Q/2	S	T
U	V/2 W/2	W/2 V/2	X	Y

FIG. 20D

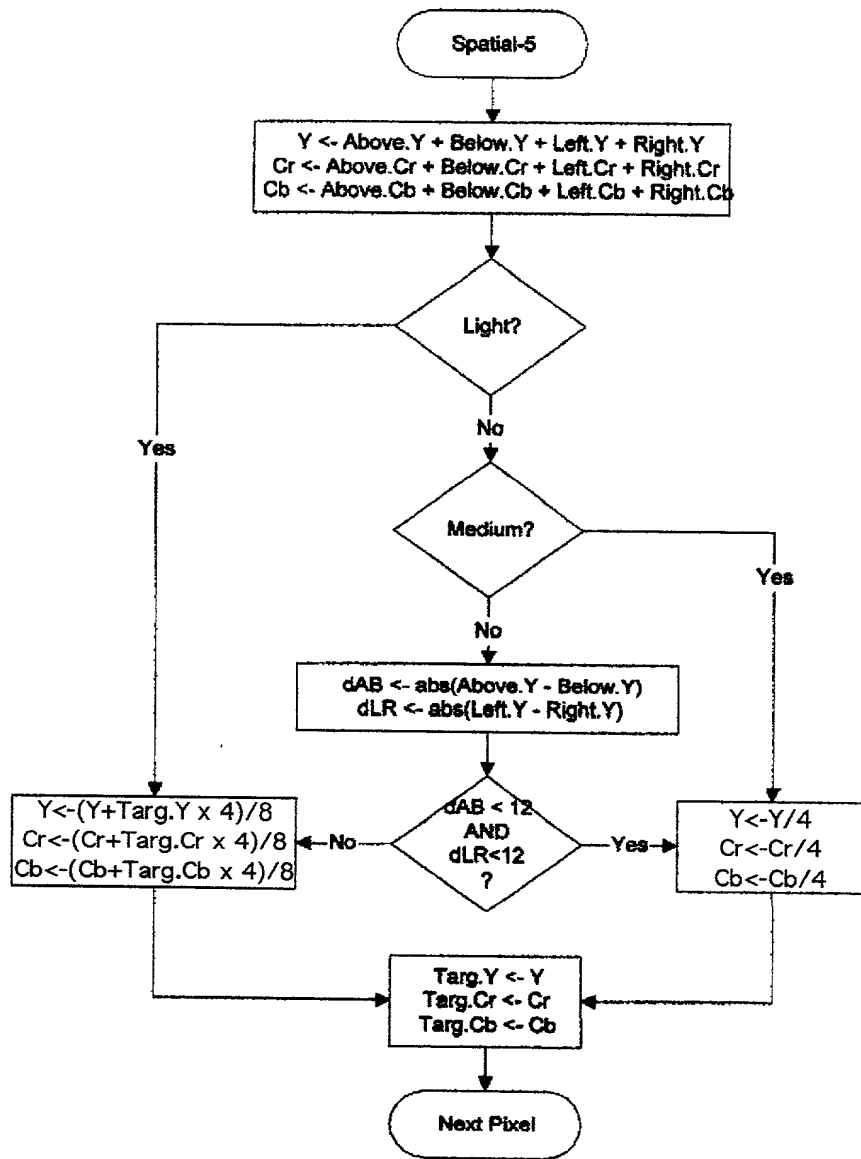


FIG. 21

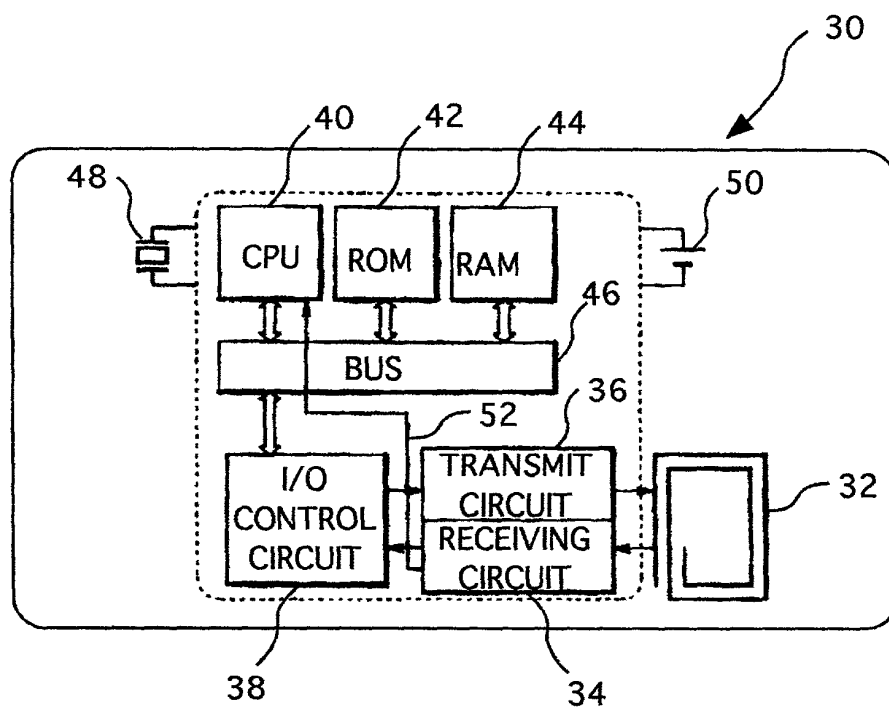


FIG. 22